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CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

(FOUO 9/80)

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980

[Excerpts from New Journal "Electronic Modeling"]

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NEW JOURNAL: ELECTRONIC MODELING

ANNOTATION

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 1

[Excerpt]

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Division of Physical-Technical Problems of Power Engineering;

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It is published 6 times a year.

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NEW PROBLEMS OF SIMULATION OF LARGE TECHNICAL SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 3-11

[Article by K. D. Zhuk]

[Excerpts] A significant number of papers in Soviet and foreign literature [6-10] have been devoted to the investigation of the problems of the design of complex systems. In the work on complex systems, large size systems with differential dynamics have been isolated [6], systems with many levels and complex nature of interaction but having discrete nature of functioning of the network type [9]. The complex systems, the functioning of which is represented by models with probability characteristics [10], have become widespread.

The enumerated versions of the models of complex systems were investigated for the description of the laws of functioning of individual classes of objects, at the same time not permitting mathematical matching of these models for investigation of other processes (for example, the depletion and recovery of the reserves of large technical systems) and properties (the attainability of goals, the reliability of performance of operations, and so on).

The models discussed in this article make it possible to solve many applied problems of the simulation of large technical systems in which quite strict conditions of mathematical agreement of the differential dynamic models with the automated models, their "hybrids" with alternative networks, thus obtaining models of dynamic operations, are obtained. This makes it possible also to construct and investigate packages of dynamic operations.

BIBLIOGRAPHY

1. Zhuk, K. D. "Problems of the Axiomatic Approach to the Construction of the Theory of Logical-Dynamic Control Systems," AVTOMATIKA [Automation], Nos 5, 6, 1971, pp 11-17, 9-14.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

2. Zhuk, K. D. "Study of the Problems of Optimizing Hierarchical Systems with Controllable Structure," PREPRINT INSTITUTA KIBERNETIKI AN USSR [Preprint of the Cybernetics Institute of the Ukrainian SSR Academy of Sciences], Nos 74-4, Parts 1, 2, Kiev, 1974, 40 pp; 42 pp.

3. Zhuk, K. D. "Methods of Systems Planning and Design as the Basis for Developing SAPR," PREPRINT INSTITUTA KIBERNETIKI AN USSR, Nos 76-1, Kiev, 1976, 26 pp.

4. Zhuk, K. D.; Timchenko, A. A.; Dolenko, T. I. ISSLEDOVANIYE STRUKTUR I MODELIROVANIYE LOGIKO-DINAMICHESKIKH SISTEM [Study of the Structures and Simulation of the Logical-Dynamic Systems], Kiev, Nauk. dumka, 1975, 199 pp.

5. Zhuk, K. D. "Some New Problems of Systems Planning and Design of Control Complexes," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY [Control Systems and Machines], No 3, 1973, pp 18-25.

6. Atans, M.; Falb, P. OPTIMAL'NOYE UPRAVLENIYE [Optimal Control], Moscow, Mashinostroyeniye, 1968, 764 pp.

7. Kalman, R.; Falb, P.; Arbib, M. OCHERKI PO MATEMATICHESKOY TEORII SISTEM [Outlines of the Mathematical Systems Theory], Moscow, Mir, 1971, 400 pp.

8. Sarkisyan, S. A., et al. BOL'SHIYE TEKHNICHESKIYE SISTEMY [Large Technical Systems], Moscow, Nauka, 1977, 350 pp.

9. Vilkas, E. "Some Problems of Combining Goals," PROBLEMY PLANIROVANIYA I UPRAVLENIYA EKONOMICHESKIMI TSELENAPRAVLENNYMI SISTEMAMI [Problems of Planning and Control of Economical Purposeful Systems], Novosibirsk, Izd. SO AN SSSR, 1972, pp 12-18.

10. Yermol'yev, Yu. M. METODY STOKHASTICHESKOGO PROGRAMMIROVANIYA [Methods of Stochastic Programming], Moscow, Nauka, 1976, 240 pp.

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PROBLEMS OF THE ANALYSIS AND SYNTHESIS OF GENERALIZED QUASIANALOG MODELS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 11-16

[Article by G. Ye. Pukhov, A. F. Verlan', I. Ye. Yefimov]

[Excerpts] The principle of similarity of the simulated and simulating phenomena which forms the basis for the application of physical models in research practice permits use of the similarity criteria to transform information about the behavior of a model into information about the behavior of the object. At the same time this principle is the basic factor limiting the possibilities of physical simulation. Hence it follows that the expansion of the range of application of physical models can be achieved as a result of replacement of the similarity principle requiring the presence of simple analogies by the more general principle, for example, equivalence forming the basis for the theory of quasianalog simulation [1], the application of which in the field of electronic simulation has led to the creation of new types of models.

The investigated class of problems connected with the generalized quasianalog simulation is not exhaustive, but it gives a sufficient idea of the possibilities of generalized quasianalog models, the nature and the volume of the research and also the paths of solution of the problems arising when creating this type of model.

BIBLIOGRAPHY

1. Pukhov, G. Ye. METODY ANALIZA I SINTEZA KVASIANALOGOVYKH ELEKTRONNYKH TSEPEY [Methods of Analysis and Synthesis of Quasianalog Electronic Circuits], Kiev, Nauk. dumka, 1967, 568 pp.

2. Malinovskiy, B. N.; Rabedzhanov, N. "Methods of Mathematical Simulation for a Hybrid Computer System," KIBERNETIKA [Cybernetics], No 1, 1969, pp 53-57.

3. Berestov, L. M. MODELIROVANIYE DINAMIKI VERTOLETA V POLETE [Simulation of the Dynamics of a Helicopter in Flight], Moscow, Mashinostroyeniye, 1978, 158 pp.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

4. Belman, J. "Equivalent for Investigating Flight Characteristics Using the X-22A Aircraft with Variable Stability," EKSPRESS-INFORMATSIYA VINITI. VOZDUSHNYY TRANSPORT [Express Information of the VINITI Institute. Air Transport], No 24, 1974, pp 1-8.

5. Verlan', A. F. "Quality Indexes of Controllable Physical Models," TOCHNOST' I NADEZHNOST' KIBERNETICHESKIKH SISTEM [Accuracy and Reliability of Cybernetic Systems], No 5, 1977, pp 3-5.

6. Yefimov, I. Ye. "Necessary and Sufficient Conditions of the Realization of Natural Simulators," TOCHNOST' I NADEZHNOST' KIBERNETICHESKIKH SISTEM], No 6, 1978, pp 83-86.

7. Verlan', A. F.; Yefimov, I. Ye.; Shatalov, V. N. METODY OBESPECHENIYA PODOBIYA PODVIZHNYKH TRENAZHEROV LETATEL'NYKH APPARATOV [Methods of Insuring Similarity of Mobile Flight Vehicle Trainers], Kiev, 1977, 65 pp (IED Institute of the Ukrainian SSR Academy of Sciences; preprint No 128).

8. Yefimov, I. Ye.; Latyshev, A. V. METODY KONTROLYA CHISLENNOGO RESHENIYA DIFFERENTSIAL'NYKH URAVNENIY [Methods of Monitoring the Numerical Solution of Differential Equations], Kiev, 1978, 60 pp (IED Institute of the Ukrainian SSR Academy of Sciences; preprint No 171).

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QUASIANALOG SIMULATION OF QUEUEING SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 17-21

[Article by G. Ya. Beregovenko]

[Excerpts] In simulation theory there are two different approaches to the simulation of dynamic systems. The first approach is based on the similarity principle which offers the possibility of establishing a one-to-one correspondence of similar variables describing the behavior of the model and the investigated object as a result of introduction of constant scales. In this case the equations of the object and the model are distinguished only by constant sets with coefficients. Such equations are called similar but the model, the equations of which are similar to the equations of the simulated object, is called analog. The class of such models turns out to be quite narrow and, strictly speaking, does not include the ones which are constructed using the resolvers of the series analog computers. In reality, during mathematical description of these modules, along with the basic variables offering the possibility of determining the input effect and the reaction of the module, "excess" variables appear caused by the peculiarities of the operation of the modules. By comparison with the basic variables these variables are quite small, but theoretically they cannot be reduced to zero. Frequently they are neglected, by calling them machine zeros. Nevertheless, it is quite obvious that the equations of the model and the object in the general case are different, and the comparison of the results of the simulation with the results of natural tests or with the solution of the equations of the object occurs only on satisfaction of defined conditions.

Thus, even when using the traditional means of simulation, the equations of the model and the simulated object do not compare, and on interpretation of the results of the simulation it is necessary to point out the conditions, on satisfaction of which these results can be compared with the results of natural tests or with the solution of the equations of the simulated object.

On the basis of what has been stated it is possible to create specialized computers, the equations of which would differ from the equations of simulated objects. However, when satisfying defined conditions called the

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conditions of equivalence, the results of the simulation coincide with the solution of the equations of the object with accuracy to constant factors. Such devices are called quasianalog simulators. On construction of them, the second approach is used based on the principle of equivalence in the sense of the results obtained otherwise called the principle of quasianalogies [1]. Although this principle was first formulated and became widespread when synthesizing nonalgorithmic computers, it has fundamental significance when constructing any models. This is caused by the fact that the intuitive understanding of the relations between the model and the simulated object using the principle of quasianalogies is reinforced by quantitative relations in the form of conditions of equivalence.

Referring, in particular, to queueing systems, it is necessary to indicate the general trend in the use of the methods of statistical simulation for them [2-4]. Here, as a result of simulation the researcher obtains the mean values of the weighting time, the sizes of the queue, and so on. It is natural that these values must compare with the results of the natural studies of the objects represented by the corresponding queueing systems. A characteristic feature of the statistical simulation is the fact that the individual tests of the model permit us to determine the average characteristics only on the development of these tests in significant time intervals. The magnitudes of these intervals are difficult to estimate in advance, but in actual research they are determined by the time of occurrence of the transient process.

The conditions of equivalence in the sense of the results obtained during statistical simulation reduce to comparison of defined mean characteristics in the steady state mode.

The statistical models belong to the class of simulation models, and they do not presuppose the description of the investigated object using equations. At the same time the quasianalog simulation uses the equation of model, on solution of which, considering the conditions of equivalence it is possible to judge the behavior of the object.

Equations and conditions of equivalence are presented below which define the quasianalog model of the queueing system. These equations are usually realized on a digital computer and can, in contrast to the above-mentioned nonalgorithmic quasianalogs, the investigated model is algorithmic.

The basis for constructing the algorithmic quasianalog of the queueing system is the system made up of the series-connected modules performing the functions of accumulation (the accumulator) and delay (the process cycle).

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BIBLIOGRAPHY

1. Pukhov, G. Ye. METODY ANALIZA I SINTEZA KVAZIANALOGOVYKH ELEKTRONNYKH TSEPEY [Methods of Analysis and Synthesis of Quasi-analog Electronic Circuits], Kiev, Nauk. dumka, 1967, 354 pp.

2. Buslenko, N. P. METOD STATISTICHESKOGO MODELIROVANIYA [Method of Statistical Simulation], Moscow, Statistika, 1970, 154 pp.

3. Lifshits, A. L.; Mal'ts, E. A. STATISTICHESKOYE MODELIROVANIYE SISTEM MASSOVOGO OBSLUZHIVANIYA [Statistical Simulation of Queueing Systems], Moscow, Sov. radio, 1978, 214 pp.

4. Aniskov, V. V.; Vitenberg, I. M. Liberov, A. B.; Ogorodov, I. K. MODELIROVANIYE ZADACH ISSLEDOVANIYA OPERATSIY (ANALOGOVYYE SREDSTVA I METODY) [Simulation of the Problems of Investigation Operations (Analog Means and Methods)], Moscow, Energiya, 1978, 216 pp.

5. Beregovenko, G. Ya. "A Method of Investigation of Transient Processes in Electrical Circuits," MATEMATICHESKOYE MODELIROVANIYE I TEORIYA ELEKTRICHESKIKH TSEPEY [Mathematical Simulation and the Theory of Electric Circuits], No 12, 1974, pp 43-52.

6. Beregovenko, G. Ya. "Problem of Mathematical Simulation of Networks with a Delay," ELEKTRON. I MODELIROVANIYE [Electronics and Simulation], No 9, 1975, pp 39-43.

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APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

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ANALYSIS OF TABLE AND TABLE-ALGORITHMIC METHODS OF REPRODUCTION OF ELEMENTARY FUNCTIONS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980, pp 22-27

[Article by V. B. Smolov, V. D. Baykov]

[Excerpts] At the present time in connection with the appearance of economical permanent memories in the integral execution, interest has been aroused in the problems connected with the investigation and the realization of table and table-algorithmic methods of calculation [1-6].

The class of problems, the solution of which can be realized using tables is extraordinarily broad. First of all, in addition to arithmetic operations these include various operations of code conversion: from decimal code to seven-segment deexcitation code, binary to decimel conversions, the conversion of radians to degrees and back, and so on. Secondly, it is possible on the basis of tables to solve the problems of the organization of various methods of addressing, the search and sorting algorithms. Finally, one of the effective spheres of application of the tables is reproduction of the elementary functions.

The term "reproduction" instead of "calculation" was not selected randomly, for with respect to their operation the tables reflect not the calculation process, but only its results. The more complex the functional relation between the input and output of the tables, the more effective their application.

The reproduction on a table base of the functions of one variable, for example, of the type of $y=\sin X \cdot \mathrm{sh} X+\cos X \cdot \mathrm{ch} X$ requires no more time than realization of the functions $z=\sin X$. By this property the table realization differs theoretically from the register which for calculation of the function y requires much more time than for z. On the other hand, the matrix realization of the function y by comparison with z requires significantly more equipment. In addition, for table realization of the volume of preliminary calculations increases which in a number of cases can be the brake in the application of the table methods directly.

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Table 4

Метод введения поправки (1)	Объем ПЗУ, бит/$\log_2 \alpha$ (2)	Время вычисления (3)
Табличный (4)		
общий (5)	$\alpha^s \cdot n + \alpha^{n-s}\alpha^q(n-s)$	$t_{сл}$ (8) $+ 2t_{выб}$ (7)
частный (6)	$\alpha^s n + \alpha^{n-s}(n-s)$	$t_{умн} \div 2t_{умн}$ (9)
Логарифмирования—потенцирования (10)		
общий (5)	$\alpha^s n + \alpha^{n-s}(n-s) + \alpha^q \cdot m \cdot n + \alpha^{n-s+t}(n-s+t)$	$3m(t_{сл} + t_{выб})$ (7)
частный (6)	$2\alpha^s \cdot n + 2\alpha^{n-s}(n-s) + \alpha^{n-s+t}(n-s+t)$	$3t_{сл} + 6t_{выб}$ (7)
Полиномиальный (11)		
общий (5)	$\alpha^s n + \alpha^q mn$	(8) $m(t_{умн} + t_{сл})$
частный (6)	$(\alpha^s + m)n$	$\left(\frac{m}{2} + 2\right)(t_{умн} + t_{сл})$ (9) (8)
Итерационный (12)	$\alpha^s n + (n-s)(n-s)$	(9) (8) $(\alpha-1)(n-s)t_{сл}$
Численного интегрирования (13)	$\alpha^s n$	$t_{умн} + \alpha^{n/3-s}t_{сл}$ (8) (9)

Key:

1. Method of introducing the correction
2. Permanent memory size, bits/$\log_2 \alpha$
3. Calculation time
4. Table
5. Total
6. Partial
7. Access
8. Addition
9. Multiplication
10. Logarithmization-involution
11. Polynomial
12. Iterative
13. Numerical integration

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For example, when reproducing the elementary functions of the arguments containing 32 to 64 binary bits, it is necessary in advance to calculate 2^{32} to 2^{64} values of the function. The minimum time achievable by modern high-speed computers when calculating only one value of the functional will be no less than 10 microseconds; consequently, for calculation of 2^{64} values a time of $18.4 \cdot 10^{13}$ sec$\approx 6x10^6$ years is required. Consequently, in order to make the preliminary table calculation time realistic it is necessary to increase the speed of the computer means by at least 10 million times.

Accordingly, in particular when working with large word-lengths, not purely table but table-algorithmic methods of calculation have become widespread. A general characteristic of the given methods is the combination of the table search in accordance with the high-order part of the argument with the introduction of a correction which depends on the low-order part. When calculating the correction, both the general and specialized approach are used.

In conclusion, let us present the generalizing table of basic characteristics of the described versions of the table-algorithmic methods of calculating elementary functions. The methods are primarily arranged in order of decreasing required volume of permanent memory (Table 4).

BIBLIOGRAPHY

1. MINI-EVM. PRINTSIPY POSTROYENIYA I PROYEKTIROVANIYA [Mini-computer. Principles of Construction, Planning and Design], Kiev, Nauk. dumka, 1975, 200 pp.

2. Kuz'min, I. V., et al. SINTEZ VYCHISLITEL'NYKH ALGORITMOV UPRAVLENIYA I KONTROLYA [Synthesis of Computer Monitoring and Control Algorithms], Kiev, Tekhnika, 1975, 246 pp.

3. Oranskiy, A. M. APPARATNYYE METODY V TSIFROVOY VYCHISLITEL'NOY TEKHNIKE [Equipment Methods and Digital Computer Engineering], Minsk, Izd-vo BGU, 1977, 208 pp.

4. Il'in, V. A.; Popov, Yu. A.; Druzhinina, I. I. "Utilization of Abbreviated Tables when Calculating Elementary Functions," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY [Control Systems and Machines], No 1, 1979, pp 58-60.

5. Mikhaylova, N. V.; Shauman, A. M. "Table-Iteration Method of Extracting the Square Root," VYCHISLITEL'NAYA TEKHNIKA I VPPROSY KIBERNETIKI [Computer Engineering and Problems of Cybernetics], Izd-vo LGU, No 15, 1978, pp 40-50.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

6. Potapov, V. I.; Florensov, A. N. "Table-Algorithmic Method of Executing the Function of a Logarithm on a Digital Computer," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY, No 4, 1978, pp 90-94.

7. Pukhov, G. Ye. "Method of Fixed Increments," ELEKTRONIKA I MODELIROVANIYE [Electronics and Simulation], No 9, 1975, pp 5-8.

8. Smolov, V. B.; Baykov, V. D. "Principles and Prospects of the Application of the Method of 'Digit by Digit' Calculation," ELEKTRONIKA I METODY GIBRIDNYKH VYCHISLENIY [Electronics and Methods of Hybrid Calculations], Kiev, Nauk. dumka, 1978.

9. Balashov, Ye. P.; Smolov, V. B., et al. "Problem of the Application of Abbreviated Tables of Functions to Construct High-Output Uniform Processors," UPRAVLYAYUSHCHIYE SISTEMY I MASHINY, No 3, 1975, pp 99-102.

10. Aristov, V. V. "Introduction to the Theory of the Method of 'Digit by Digit' Calculations," MASHINNYY ANALIZ I MODELIROVANIYE ELEKTRICHESKIKH TSEPEY [Machine Analysis and Simulation of Electric Circuits], Kiev, Nauk. dumka, 1978, pp 186-196.

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PARALLELING METHODS FOR THE SOLUTION OF SYSTEMS OF EQUATIONS OF LARGE DIMENSIONALITY ON MULTIPROCESSOR STRUCTURES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 28-32

[Article by L. Ya. Nagornyy]

[Excerpts] Increasing the output capacity and the efficiency of modern means of digital and hybrid computer engineering is one of the urgent problems. At the present time a trend is being observed toward the creation of high-output computer means based on multiprocessor structures. Among the variety of problems which must be solved on such structures, the solution of large systems of linear and nonlinear algebraic and differential equations with dense and sparse matrices is of great interest. It is possible to increase the output capacity and the efficiency of especially multiple solution of systems of such equations as a result of applying the methods permitting parallel solution of these problems on multiprocessor structures.

In the given paper, on the basis of diakoptics [1-8] methods are proposed for modular parallel solution of the systems of equations of large dimensionality with a sparse matrix on multiprocessor structures.

In conclusion it is necessary to note that if we realize linearization and algebraization of the nonlinear equations, the proposed methods can be used for paralleling the solution of systems of equations of large dimensionality with sparse matrices on N processors. Thus, in reference [5] one of the algorithms is presented for conversion from the nonlinear system of differential equations with sparse matrix to the system of linear algebraic equations with modular-diagonal matrix with a frame. This representation of the system of initial equations will permit the application of the method of paralleling the solution of the systems of equations with modular-diagonal matrix with a frame to it.

BIBLIOGRAPHY

1. Pukhov, G. Ye. "Theory of the Method of Subnetworks," ELEKTRICHESTVO [Electricity], No 8, 1952, pp 58-61.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

2. Kron, G. ISSLEDOVANIYE SLOZHNYKH SISTEM PO CHASTYAM. DIAKOPTIKA [Investigation of the Complex Systems by Parts. Diakoptics], Moscow, Nauka, 1972, 542 pp.

3. Nagornyy, L. Ya. "Method of Subnetworks for Computer Calculation of Electronic Circuits with Respect to a Matrix of Hybrid Parameters," IZV. VUZOV. SER. RADIOELEKTRONIKA [News of the Institutions of Higher Learning. Radio Electronics Series], Vol 18, No 6, 1975, pp 60-67.

4. Nagornyy, L. Ya. "A Method of Solution of Large Systems of Equations with Sparse Matrix on a Digital Computer," ELEKTRON. I MODELIROVANIYE [Electronics and Simulation], No 11, 1976, pp 84-86.

5. Nagornyy, L. Ya.; Zhukov, I. A. "Computer Solution of Large Systems of Nonlinear Differential Equations with Sparse Structure," AVTOMATIZATSIYA PROYEKTIROVANIYA V ELEKTRON. [Automation of Planning and Design in Electronics], No 17, 1978, pp 61-65.

6. Nagornyy, L. Ya. MODELIROVANIYE ELEKTRONNYKH TSEPEY [Simulation of Electronic Circuits], Kiev, Tekhnika, 1974, 360 pp.

7. Petrenko, A. I.; Vlasov, A. I.; Timchenko, A. P. TABLICHNYYE METODY MODELIROVANIYA ELEKTRONNYKH SKHEM NA EVM [Table Methods of Simulating Electronic Circuits on Computers], Kiev, Vishcha shkola, 1977, 188 pp.

8. Chen, R. "Solving a Class of Large Sparse Linear Systems of Equations by Partitioning," PROC. IEEE INT. SYMPOS., Toronto, Can., 1973, 520 pp.

9. Tinney, U.; Uolker, D. "Direct Solutions of Quasimodular Circuit Equations by Optimally Ordered Expansion of the Matrix in Triangular Cofactors," TR. IN-TA ELEKTRON. I RADIOTEKHNIKA [Works of the Institute of Electronics and Radio Engineering], No 11, 1967, pp 1129-1133.

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CSO: 1863

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

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APPLICATION OF MICROPROCESSOR SYSTEMS FOR THE SIMULATION OF NONLINEAR ELECTRONIC CIRCUITS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 32-41

[Article by A. I. Petrenko, A. T. Chigrin]

[Excerpts] At the present time increased interest is being observed in the solution of complex engineering problems on multiprocessor systems and uniform computer structures. These include the problem of the simulation of electronic nonlinear systems. Here the models of the electronic circuits considering the modern methods of solution of nonlinear algebraic and nonlinear "rigid" differential equations are reduced to a multiply solved system of linearized equations of dimensionality nXn of the type

$$Ax = b. \tag{1}$$

In the article a study is made of the survey of methods of parallel solution of the given system of equations on the multiprocessor system when the sparseness of the matrix of equations of the system A and the number of multiprocessors $m<n$ are taken into account. The optimal algorithm with respect to number of operations for parallel solution of the system of equations (1) is substantiated, and it is demonstrated that the total solution time does not improve significantly with an increase in the number of microprocessors exceeding the average number of nonzero elements in a row of the matrix A.

In conclusion let us note that in spite of the obvious progress in the development of the methods and algorithms of machine planning and design of large electronic circuits, the problem of the admissible dimensionality of the solved problems and the speed of the solution itself remains urgent as before. Sometimes it is possible to talk about the possibility of the creation of a parallel specialized processor based on microprocessor sets of large integrated circuits to solve the base operation when simulating electronic circuits, that is, for multiple solution of a system of linear algebraic equations. This parallel specialized processor can significantly expand the possibilities of the minicomputers used as part of the automated work spaces of the developers of modern complex electronic equipment. However, the new technical means require

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careful analysis and reexamination of the arsenal of algorithms of the formation and solution of the equations of models of electronic circuits and also successful combination of macro and microparallel operations.

BIBLIOGRAPHY

1. Petrenko, A. I.; Vlasov, A. I.; Timchenko, A. P. TABLICHNYYE METODY MODELIROVANIYA ELEKTRONNYKH SKHEM NA ETSVM [Table Models of Simulation of Electronic Circuits on Digital Computers], Kiev, Vishcha shkola, 1977, 188 pp.

2. Sigorskiy, V. P.; Petrenko, A. I. ALGORITMY ANALIZA ELEKTRONNYKH SKHEM [Algorithms for Analysis of Electronic Circuits], Moscow, Sov. radio, 1976, 608 pp.

3. Petrenko, A. I.; Nagornyy, L.Ya. "Methods of Diakoptics when Simulating Large Electronic Circuits," AVTOMATIZATSIYA PROYEKTIROVANIYA V ELEKTRONIKE [Automation of Planning and Design in Electronics], Kiev, Tekhnika, No 20, 1979, pp 49-55.

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APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

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ORGANIZATION OF THE COUNTING-REGISTER STRUCTURES FOR SIMULATION OF THE PROBLEM OF RESERVE DISTRIBUTION

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980, pp 42-49

[Article by A. M. Shchetinin]

[Excerpts] At the present time specialized counting-register structures constructed on the basis of digital analogs [1] are being used to calculate the PERT chart. This arises from the fact that such structures are characterized by multiprocessor nature with parallel information processing.

Each elementary processor of the computer structure is designed for simulation of one operation of the investigated PERT chart, that is, the element of the structure simulates the time for the performance of the corresponding operation and also the amount of the reserves used. The solution process in this structure is similar to the activity wave propagation in an excited medium [2]. Beginning with this, the individual element of the structure can be in a state of rest, processing (operating state) and restoration of information.

For calculation of the PERT chart, the duration and reserve of simulated work are entered in each elementary processor, and the input and output terminals of the processors are connected to each other according to the topology of the given chart.

For the beginning of the solution, the external excitation signal which, on being propagated through the structural elements, forms the operating processor front at each point in time, is fed to the structure. The activity wave encompasses the investigated structure in series in time and parallel in the set of processors, and it notes the elements which determine the critical path of the PERT chart.

If the solution process is halted, then each processor stores its last state until the process continues. The indicated property permits calculation of the total reserve on the given operations front for each point in time.

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Above, three approaches were investigated to the solution of the problem of determining the total reserve with respect to the front: series and parallel simulation of the reserve characteristics of all processors belonging to the investigated front and series calculation of the reserve of the front in the structure with generalized memory.

The first two structures permit simulation of the magnitude of the reserve characteristic. For parallel simulation of the intensities, the time for determination of the front reserve is reduced significantly. Accordingly, the use of the distributed memory in the structure permits simulation not only of the constant values of the reserve, but also insurance of simulation of the characteristic $z_{ij}=f(t)$ in the processor. For this organization of work it is necessary in each element of the structure to provide an additional junction in place of the reserve shaper.

The use of the structure with generalized memory to calculate the total reserve of the front permits reduction of the time for solution of the stated problem to the number of cycles equal to the number of processors in the state of information processing. However, in the given structure the possibility of variation of the intensity according to the given law $z_{ij}=f(t)$ is excluded, for in this case the necessity arises for variation at each point in time of the information about the reserve characteristics stored in the memory cells.

BIBLIOGRAPHY

1. Vasil'yev, V. V.; Dodonov, A. G. GIBRIDNYYE MODELI ZADACH OPTIMIZATSII [Hybrid Models of Optimization Problems], Kiev, Nauk. dumka, 1974, 215 pp.

2. Dodonov, A. G.; Shchetinin, A. M. "Principles of Constructing the Network Computer Structures and Analysis of Their Functioning," PARALLEL'NYYE MASHINY I PARALLEL'NAYA MATEMATIKA [Parallel Machines and Parallel Mathematics], Kiev, Znaniye, 1978, pp 15-17.

3. Dodonov, A. G. "Solution of the Problem of Reserve Distribution in a Digital Model," MATEMATICHESKOYE MODELIROVANIYE I TEORIYA ELEKTRICHESKIKH TSEPEY [Mathematical Simulation and the Theory of Electrical Circuits], Kiev, Nauk. dumka, 1968, pp 138-140.

4. Dodonov, A. G.; Shchetinin, A. M. "Some Principles of the Isolation of a Subset of Elements in a Uniform Computer Structure," MODELIRUYUSHCHIYE GIBRIDNYYE SISTEMY [Simulating Hybrid Systems], Kiev, Nauk. dumka, 1978, pp 43-49.

5. Dodonov, A. G.; Khadzhinov, V. V.; Shishmarev. V. M.; Shchetinin, A.M. "Computer for Solving the PERT Planning Problems," Claim No 2600771/18-24, positive decision to publish as of 16 November 1978, permission for publication 25 July 1979.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

6. Dodonov, A. G.; Fedotov, N. V.; Khadzhinov, V. V.; Shchetinin, A. M. "Device for Calculating Current Reserves," Claim No 2579670/18-24, positive decision to publish as of 31 August 1978, permission for publication as of 25 July 1979.

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[201-10845]

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AUTOMATIC COMMUTATION SYSTEMS FOR ANALOG PROCESSORS OF HYBRID COMPUTER SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 49-55

[Article by N.I. Senchenko]

[Excerpts] Modern hybrid computer systems are multiprocessor machines. In such hybrid computer systems, digital input of the data (3-5 microseconds) [1-3], automatic preparation of the semiconductor computer modules for operation, and automatic composition of the solution circuit in accordance with the given mathematical description are realized. The given multiprocessor systems can operate in the time sharing mode and have different analog-digital and graphical displays. At the present time hybrid computer systems are finding application in more than 30 fields of science and engineering [3,4]. The level of development of hybrid computer systems has made it possible to create an experimental hybrid network containing analog and digital computers [2] which includes 3 YeAl 8800 analog computers, four YeAl 680 analog computers and one YeAl 580, and three digital computers-YeAl 8400, CDC 1700 and GE.

The effectiveness of using hybrid networks and individual hybrid computer systems depends to a great extent on the possibility of the automation of the process of preparation and selection of the problems in the analog part of the hybrid computer systems. The compilation of analog structural circuits at the present time is carried out by special algorithms by the digital part of the hybrid computer system. However, the process of selecting the topology of the connections of the computer modules, in spite of certain successes, poorly lends itself to automation. This is connected primarily with the difficulties which arise when developing automatic commutation systems.

In this article a study is made of the general structure of automatic commutation systems; the existing commutators for automatic patching and their operating principles are described, the composition and a brief characterization of the software for the automatic commutation systems which are in operation at the present time, are presented.

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At the present time a number of automatic commutation systems are known which have found application in hybrid computer systems. Let us consider the basic characteristics of some of them.

The system for automatic patching for the GVS-100 hybrid computer system was developed at the Control Problems Institute (USSR) [9, 10]. In order to decrease the number of switches of the automatic commutation system, the computer modules are joined into combined and multifunctional devices of three types. For the control of the operating conditions of these modules, special registers and switches of the sign of the coefficients are used. In all, in the analog processor GVS-100, 20 integrator-summators, eight multiplier-dividers and eight functional converters are switched. The computer modules are broken down into four like modules. The automatic computation system is constructed by the two-step system of incomplete single-stage concentrators, which has made it possible to reduce the number of switches almost in half by comparison with the system of complete concentrators. In all, the automatic commutation system contains 1600 commuting elements based on 80 plates. The automated commutation system is serviced by a special system of software which performs the operations of grouping, conversion, placement and selection.

The operation of "grouping" in accordance with the modular structure of the commutator brings about conversion of the matrix of requirements which is the analog of the structural diagram of the problem.

When performing the operation of "conversion" the restrictions on the intermodular couplings are taken into account, and the "arrangement" operation forms the commutation file. The system is specialized and it is designed for working with commutators constructed by the two-step system of incomplete, single-stage concentrators. The total selection time for the problem will be no more than 1 millisecond.

Since the fourth-generation hybrid computers are multiprocessor systems, there must be a sufficient number of modules in them for the solution of a large problem. It is proposed that the standard system include 40 modules. Of them, 24 are amplifier modules, there are five functional converter modules, five computer modules, five mixed modules and four logical modules. The total number of switches required for automatic commutation of such a system is more than 100,000. Although this is a very large number of switches, at the present time on the basis of the existing 16-channel integral multiplexors executed from one crystal, it is possible to realize a matrix of 20,000 switches using 1250 cases. The entire matrix can be placed in a bay 500 mm high and 475 mm wide [1].

The prediction of the development of the hybrid computer systems themselves indicates that obviously in the near future the degree of integration of the analog systems will increase by 5 to 10 times. The complexity of the analog processors increases to 1000 integrators. The tuning speed of the automatic commutation system reaches 1 millisecond.

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If a large analog processor (1000 integrators) is not required to solve the problem, it is possible to arrange the computer modules by parts containing 50, 100, and 200 integrators. The automatic distribution of the reserves in this case offers the possibility for 20 users to work on the hybrid computer systems simultaneously, each of which has complete access to the hybrid computer system.

In conclusion, let us draw some conclusions. The analysis of the state of the operations in the region of construction of the automatic commutation sytems and their software indicates that significant progress has been made in this area.

The total automation of the tuning of the analog processor of the hybrid computer systems offers the possibility of working very effectively in the time-sharing mode, which makes it possible to increase the load of the analog processor from 10% to 90% of the total operating time of the hybrid computer system.

The appearance of the hybrid computer systems operating in the time-sharing mode and with automatic patching and also hybrid networks requires the development of new principles of organizing the software of the analog processors, the creation of operation systems for working with remote terminals, the solution of the problem of effective splitting of the problem into analog and digital parts.

A significant increase in complexity of the fourth-generation hybrid computer systems states the problem of modular organization of analog processors and dynamic distribution of the problems among the modules, which offers the possibility of simultaneous access to the hybrid computer system by many users.

The theoretical and practical results obtained indicate that hybrid computer systems with automatic commutation constitute a prospective area for the construction of highly efficient means of simulating dynamic systems.

BIBLIOGRAPHY

1. Rubin, A. I.; Keene, D. H. "The Future of Hybrid Computation," SIMULATION, Vol 25, No 2, 1975, pp 55-59.

2. Ricci, F. J.; Nixon, F. E. "A Remote Terminal for Accessing Large Hybrid Computers," SIMULATION, Vol 27, No 5, 1976, pp 171-176.

3. Landauer, J. P. "Modern Hybrid Computer Technology and its Applications in Scientific-Engineering Analysis," IEEE INTERCON TECHNICAL PAPERS, Vol 4, 1973, Mo. 18/1, pp 1-9.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

4. Korn, G. A.; Vichnevatskiy, R. "Analog/Hybrid Computation and Digital Simulation," IEEE TRANS. COMPUT., Vol 25, No 12, 1976, pp 1312-1320.

5. Hannauer, G. "Automatic Patching for Analog and Hybrid Computers," SIMULATION, Vol 12, No 5, 1969, pp 219-232.

6. Taratorin, Yu. I. "Automation of Problem Selection in the Analog Part of the Hybrid Computer System," AVTOMATIKA I TELEMEKHANIKA, [Automation and Telemechanics], No 2, 1975, pp 136-140.

7. Murashko, A. G.; Senchenko, N. I.; Terent'yev, M. F. "Principles of Constructing the System for Automatic Commutation of Operation Elements to the Resolving Structure," ANALOGOVAYA I ANALOGO-TSIFROVAYA VYCHISLITEL'NAYA TEKHNIKA [Analog and Analog-Digital Computer Engineering], No 6, 1973, pp 109-114.

8. Gracon, T. I.; Strauff, J. C. "A Decision Procedure for Selecting Among Proposed Automatic Analog Computer Patching Systems," SIMULATION, No 9, 1969, pp 133-145.

9. Taratorin, Yu. I. "Automatic Problem Selection in the Analog Computer," SOVREMENNYYE PROBLEMY UPRAVLENIYA [Modern Control Problems], Moscow, Nauka, 1974, pp 126-129.

10. Taratorin, Yu. I. "Synthesis of the System for Automated Problem Selection in the Analog Part of Hybrid Computer Complex," AVTOMATIKA I TELEMEKHANIKA, No 4, 1976, pp 157-165.

11. Khou, R. M.; Khollsten, R. B. "Hybrid Computer Systems with Time Sharing -- A New Step in Machine-Oriented Design," AVTOMATIZATSIYA V PROYEKTIROVANII [Automation in Planning and Design], Moscow, Mir, 1972, pp 103-112.

12. Terayama, S.; Iseki, Y.; Lino, Y.; Fujimoto, T.; Tanimoto, M. Ishiki, I. "Automatically Patched Hybrid Computer," KEISOKU TO SEIGYO, Vol 11, No 12, 1972, pp 1034-1043.

13. Masahisa Kohno, Kazuo Kurokawa. "On the Availability for Subrouting Analog Setup Circuits on a Stored Program Hybrid Computer System," PROCEEDINGS OF THE SUMMER COMPUTER SIMULATION CONFERENCE, Montreal, Vol 1, 1973, pp 301-311.

14. Hecht, V.; Reuss, W.; Rzehak, H. "A Hybrid Compiler with Automatic Patching System," SIMULATION, No 6, 1975, pp 185-192.

15. Howe, R. M.; Hollstien, R. B. Moran, R. A. "Hardware/Software Considerations in the AD/FOUR Electronically Patched Hybrid Computer," PROCEEDINGS OF THE IFIP CONFERENCE ON INFORMATION PROCESSING, 1971, pp 668-674.

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

16. "Fully Automatic Hybrid Computer," JEE JAPAN ELECTRONIC ENGINEERING, No 61, 1971, pp 42-43.

17. Elzas, M. S. "Do Automated Hybrids Have a Credible Future," paper presented at the Summer Computer Simulation Conference, Montreal, July 1973.

18. Krasnogorova, V. S.; Murashko, A. G.; Senchenko, N. I. "Procedure for Constructing an L-fold Computing Matrix for Analog Structures," AVTOMATIKA I TELEMEKHANIKA, No 7, 1974, pp 172-177.

19. Meerkamp, D. "Automatic Patching System, APS," ELECTRONIC ASSOCIATES, INC. REPORT, Vol 28, No 1, 1971, pp 31-80.

20. Howe, R. M.; Moran, R. A.; Berge T. D. "Time-Sharing of Hybrid Computers Using Electronic Patching," SIMULATION, No 9, 1970, pp 105-112.

21. Akijama, S. "Pseudo Setup Pattern Set on Analog Computers," DENSHI GIYUZU SOGO KENKYUSHO IHO. BULL. ELECTROTECHN. LAB., Vol 35, No 4, 1971, pp 353-360.

22. Howe, R. M. "The Next Generation of Hybrid Computer Systems," PROCEEDINGS OF THE NATIONAL ELECTRONICS CONFERENCE, Chicago, Vol 29, 1974, pp 140-145.

23. Kurokawa, K. "All IC Hybrid Computer Eliminates the Patchwork from Programming," ELECTRONICS, No 6, 1969, pp 100-107.

24. Dekker, L.; Brok, S. W.; Andriessen, J. H. M.; Zuidervaart, J. C. "Automation of a Hybrid Computer System and Design Aspects of a Future Hybrid Processor," SIMULATION OF SYSTEMS, Vol 77, 1976, pp 1077-1091.

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[201-10845]

10845
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STRUCTURE OF THE DIGITAL MODEL FOR SOLVING SYSTEMS OF ALGEBRAIC EQUATIONS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980, pp 55-59

[Article by A. A. Bal'va, V. D. Samoylov]

[Excerpts] In reference [1] a study was made of the general block diagram and some versions of the construction of digital structural-analog models designed for the solution of systems of algebraic equations, the basis for the functioning of which is the minimization of the function $f=\sum_{i=1}^{m} |\varepsilon_i|$ where ε_i are the errors in the system equations.

With respect to their structure the investigated models belong to the category of second-type quasianalog models [2] in which the quasianalog is used to obtain the discrepancy vector, and the equalizing device organizes the process of its minimization. These models are designed for use as part of hybrid systems in order to increase the information output capacity of the latter. The systems use of such models imposes certain conditions on their structural execution, namely, in the model it is necessary to provide in advance convenient input-output devices, definite representation of information, the possibility of automated control of the operating conditions and entering of the information, and so on. All of these requirements must be satisfied when creating the model, which insures minimum additions in the communications structure when connecting the models into the system.

Let us consider in more detail the following possible version of the structural execution of the model in which:

1) An effort is made to combine the execution of the operations of finding the discrepancy vector and the gradient vector in the same element -- the circuits for multiplying a number by a symbol and combination adders which leads to reduction of the total amount of the equipment in the model;

2) Modules are introduced for organizing the logical operations required to realize the algorithmic exits from the cycle;

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3) The storing of the coefficients, the gradient vector and the vector of the variable is in the memory elements.

The algorithm for the solution of the systems of linear algebraic equations realized in the given model is presented in Fig 1. The algorithm is a reflection of the results of the investigations, the essence of which is discussed in [3, 4]. The vector of the variables, the gradient vector and the discrepancy vector are found by successive passes through the columns of the matrix of coefficients.

The block diagram of the model is presented in Fig 2.

The model consists of the memory module, which includes the coefficient memory nodes, the gradient memory, the memory of variables, the modules for shaping the discrepancies, the discrepancy counters, shaping the gradient, shaping the variables, the module for the logic of the control of convergence and also the modules for memory access, initial entry and the controlling automation. The memory, the module for shaping the discrepancies, the module of discrepancy counters, the memory junction for the variables and the module for shaping the variables are part of the quasianalog of the model; the gradient memory junction is the equalized device.

By the given flow chart of the model a laboratory mockup was made designed to solve the systems of linear algebraic equations. The numbers in the model are presented in binary code with a word length of 8. The possibility of increasing the order of the solved system and the word length of representation of the numbers are provided for.

Each of the memory junctions is executed from the YaM411 memory elements, the ZhL155 write and read elements, and it is designed for storing eight 8-bit words. Provision is made for the possibility of functional expansion of the memory. The input signals of each of the memory modules are the null setting signals Z0 [I], the information entering signals Z [I], the codes of the entered numbers, the address access signals for the memory cell. The address access is by address buses common to all of the memory modules to which the signals come from the outputs of the access module. Structurally each of the memory modules is executed from a separate mutually replaceable TEZ.

The simulation of a large number of problems with resolvable and absolute cyclces confirmed the correctness of the algorithms used as the basis for functioning of the model.

Generalizing the results, it is possible to draw the following basic conclusions.

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1. The results of solving the problems on the model basically have an error not exceeding the magnitude of one step. The basic source of the error is limited word length of representation of variables and absence of fractionation of the step size.

2. The algorithm predetermines the resolvable cycle. In the case where the operating point falls in the absolute cycle it is necessary to provide for fractionation of the step and scanning of the cycle zone.

3. The convergence rate can be estimated by the number of steps required to reach the optimal solution point; for second-order systems on the average it does not exceed 100 steps.

BIBLIOGRAPHY

1. Samoylov, V. D.; Bal'va, A. A. "Some Problems of the Synthesis of Digital Problem-Oriented Processors of Hybrid Computer Systems for the Solution of Systems of Finite Equations," ELEKTRONNOYE MODELIROVANIYE [Electronic Simulation], Kiev, Nauk. dumka, 1977, pp 164-175.

2. Pukhov, G. Ye. IZBRANNYYE VOPROSY TEORII MATEMATICHESKIKH MASHIN [Selected Problems of the Theory of Mathematical Machines], Kiev, Izd-vo AN USSR, 1964, 263 pp.

3. Samoylov, V. D. "Algorithms and Estimates of Digital Optimizing Parallel Structures," MNOGOPROTSESSOPRNYYE GIBRIDNYYE SISTEMY I ALGORITMY [Multiprocessor Hybrid Systems and Algorithms], Kiev, Nauk. dumka, 1976, pp 53-79.

4. Bal'va, A. A. "Algorithms for the Functioning of Optimizing Processors of Hybrid Computer Systems for the Solution of Special Problems of Mathematical Programming," PROBLEMNO-ORIYENTIROVANNYYE PROTSESSORY V GIBRIDNYKH VYCHISLITEL'NYKH SISTEMAKH [Problem-Oriented Processors in Hybrid Computer Systems], Kiev, Znaniye, 1977, pp 3-20.

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CSO: 1863

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SOLUTION OF THE INVERSE PROBLEMS OF THERMAL CONDUCTIVITY ON ELECTRICAL MODELS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 59

[Article by Yu. M. Matsevityy, V. Ye. Prokof'yev, V. S. Shirokov]

[Text] A study is made of the possibilities of identifying the boundary conditions of heat exchange using electrical simulation. The procedure for determining the boundary conditions and the principles of constructing specialized computers are discussed. The model for the solution of the inverse problem is considered as an automated control system for the target with distributed parameters. Results are presented from a study of closed computer structures by the methods of automated control theory. Methods and devices are proposed which will provide improved accuracy in defining the boundary conditions when solving the inverse problems.

This book will be of interest to specialists studying analog computer engineering and boundary conditions in the elements of power plants.

This book will be published by Naukova Dumka press in 1980.

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HYBRID COMPUTER WITH SPECIALIZED MULTIFUNCTIONAL MEMORY

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 77-80

[Article by Yu. M. Matsevityy, O. S. Tsakanyan]

[Text] The use of hybrid computers of the R-grid-digital computer type to solve the nonlinear problems of field theory is connected with the necessity of the iteration process inasmuch as the assigned signals, just as frequently the grid structure itself, depend on the simulated function [1-3]. The iteration nature of the solution in a hybrid system leads to multiple information conversion (analog-code, code-analog) within the boundaries of one step and recalculation of the system parameters for each successive approximation. In addition, the calculations of the corrected parameters for points with identical potential are frequently duplicated. This, of course, increases the solution time, the basic part of which goes to the digital computer.

Specialized studies performed in order to discover the distribution of the machine time among the processors of the hybrid system demonstrated that 90% of the time expended on solving the problem (the two-dimensional nonlinear problem of thermal conductivity with third type boundary conditions was solved) was for the digital computer, 1% for the analog processor and 9% to assign the boundary conditions and the corrected inputs. This nonuniform distribution of the machine time among the processors of one system cannot be considered optimal; any reduction of load of the digital computer promotes increased speed of the hybrid system.

Let us consider one of the means of redistributing time among the processors which, on the one hand, leads to more uniform loading of the analog processor and the digital computer, which naturally is felt in increased speed of the system, and, on the other hand, it significantly simplifies the programming inasmuch as the built-in part of the software is utilized. This is achieved as a result of introducing an additional specialized digital processor into the hybrid system which takes on part of the functions of the digital computer connected with executing the iteration process. This triple-processor hybrid system (just as other hybrid systems of the given type) solves the nonlinear problems of field theory by the

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Liebman method after preliminary processing of the initial mathematical model when the nonlinear equation (for example, the two-dimensional problem of conductivity is used)

$$\frac{\partial}{\partial x}\left[\lambda(T)\frac{\partial T}{\partial x}\right]+\frac{\partial}{\partial y}\left[\lambda(T)\frac{\partial T}{\partial y}\right]=c(T)\rho(T)\frac{\partial T}{\partial \tau} \tag{1}$$

is converted by the substitution

$$\Theta=\int_0^T \lambda(T)\,dT \tag{2}$$

to the form

$$\frac{\partial^2\Theta}{\partial x^2}+\frac{\partial^2\Theta}{\partial y^2}=\frac{1}{a(\Theta)}\frac{\partial\Theta}{\partial\tau}, \tag{3}$$

where T is temperature; τ is time; λ, c and ρ are the coefficient of thermal conductivity, capacitance and density respectively; $a=\rho/c\rho$ is the coefficient of thermal diffusivity.

The performed conversion permits, as was demonstrated, for example, in [4, 5], significant simplification of the circuitry of the analog processor inasmuch as the lefthand side of equation (3) turns out to be linear (for its simulation there is no necessity for correcting the structure of the spatial grid).

In finite-difference form equation (3) has the form

$$\Theta_{1,n}^{(k)}+\Theta_{2,n}^{k}+\Theta_{3,n}^{(k)}+\Theta_{4,n}^{(k)}-4\Theta_{0,n}^{(k)}=\frac{h^2}{a[\Theta_{0,n}^{(k-1)}]}\times$$
$$\times\frac{\Theta_{0,n}^{(k)}-\Theta_{0,n-1}}{\Delta\tau}, \tag{4}$$

where h and $\Delta\tau$ are the space and time steps of the approximation respectively, k is the iteration number, n is the time step number.

The lefthand side of the equation is simulated on a grid of constant resistors; the righthand side can be realized differently [6], for example, using two code-controlled elements (voltage source and conductivity) connected to each assembly of the analog processor, as was done in the "Saturn" and "Neptun" analog-digital computer complexes [2, 3].

This circuit diagram permits realization of the version of the Liebman method where not all of the elements of the model are corrected, but only the temporary resistances (in the given case the code-controlled conductances). Inasmuch as the magnitude of the temporary resistance depends on the potential of the corresponding node of the grid, it is determined in the

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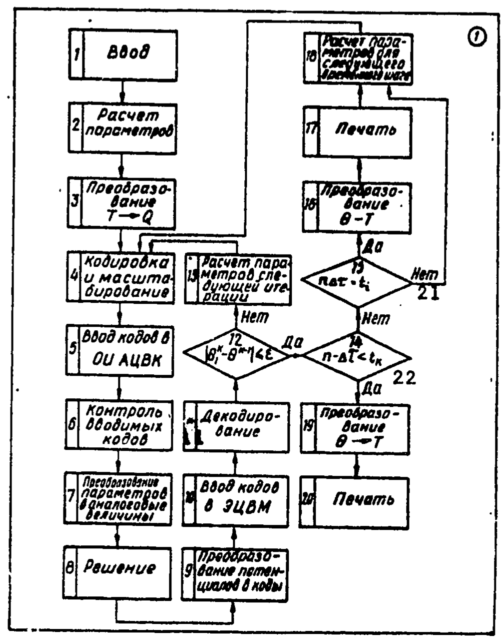

Figure 1
Flow chart of the algorithm for solving the nonlinear problem of thermal conductivity on the "Neptun" analog-digital computer complex

Key:

1. Input
2. Calculation of parameters
3. T→Q conversion
4. Coding and scaling
5. Code input to the analog-digital computer complex
6. Checking of the input code
7. Conversion of the parameters to analog variables
8. Solution
9. Conversion of the potentials to codes
10. Input of the codes to digtal computer
11. Decoding
12. $|\theta_i^k - \theta^{k-1}| \leq \varepsilon$
13. Calculation of the parameters of the next iteration
14. $n - \Delta\tau < t_k$
15. $n\Delta\tau = t_i$
16. θ-T conversion
17. Printout
18. Calculation of the parameters for the next time step
19. θ→T conversion
20. Printout
21. No
22. Yes

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solution process by the iteration method:

$$R_\tau^{(k)} = \frac{a[\Theta_{0,n}^{(k-1)}]\Delta\tau}{h^2 m_R}, \qquad (5)$$

where the scaling coefficient $m_R = R_T/Re$, R_T and R_e are the thermal and electrical resistances.

In the "Neptun" analog-digital computer complex [3] the corrected value of $R_\tau^{(k)}$ is calculated by formula (5) by the digital computer after obtaining the result of the k-1-st iteration at the corresponding point of the analog processor, after which the corrected code-control conductance is found, and the next k-th iteration is performed. The iteration process is considered to be completed if the following condition is satisfied:

$$\max|T_i^{(k-1)} - T_i^{(k)}| \leq \varepsilon,$$

where i is the number of the node of the analog processor, ε is any number given in advance.

The studies demonstrated that with this approach to the solution of the indicated class of problems with a significant reduction in cost of the hybrid computer complex (at the expense of reducing the number of code-controlled elements) high quality characteristics of the hybrid computer system are retained with completely code-controlled analog structures (such as the rate of convergence of the iteration process and the possibility of solving a broad class of problems). Let us note that here the speed of the system becomes somewhat worse by comparison with the "Saturn" type hybrid system. However, if we find optimal means for realizing the iterative computer process and give attention to the development of built-in software systems before building the above-indicated specialized processors, then the problem of reducing the speed in the investigated hybrid system cannot come up. On the contrary, the application of the specialized digital processor will lead to improvement of all of the characteristics of the system: reliability, speed, a decrease in labor consumption of programming.

Fig 1 shows the block diagram of the algorithm for solving the nonlinear problem of thermal conductivity on the "Neptun" analog-digital computer complex developed at the Institute of Machine Building Problems of the Ukrainian SSR Academy of Sciences [3]. The analysis of the block diagram shows that a significant part of the operations service the iteration process performed by the digital computer. If these functions are transferred to the specialized digital processor, this significantly unloads the digital computer and increases the speed of the entire system.

For organization of the autonomous iteration process (Fig 2) the specialized digital processor consists of a permanent memory, comparison circuit, control module and memory module. In addition to these modules Fig 2

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shows two other processors of the hybrid system (the analog processor and the digital computer) and also the node point commutator, the analog-to-digital converters and the coupling circuit. The analog processor consists of the passive model, the code-controlled voltage source module and the code-controlled conductivity module.

The triple-processor hybrid computer system shown in Fig 2 operates as follows. After input of the initial data to the digital computer and selection of the limits of the simulated region on the passive model, the digital computer calculates the variable parameters for the entire range of signal conversion in the analog-to-digital converter with step size equal to the magnitude of the low-order dip of the analog-to-digital converter. The results of these calculations are entered in the permanent memory through the coupler. Then the digital computer calculates and enters the values of the boundary and the initial conditions and also the conductivities in the memory module. On completion of the cycle of making the entry in the memory module, a command comes from the control unit by which the information is entered in the corresponding code-controlled voltage source and code-controlled conductivity module. After the conversion of the digital data to analog, the corresponding currents come to the nodes of the passive model, as a result of which the solution is formed on the R-grid in analog form. The potentials of the internal nodes of the passive model is measured using the node point commutator and the analog-digital converter. The digital equivalent of the analog potential from the output of the analog to digital converter (by the control signals from the control module) can go directly to the address register of the permanent memory and in parallel to the memory module. In order to send correction inputs to the information inputs of the code-controlled conductivity module and the code-controlled voltage source, that is, for organization of the autonomous iteration commutation process, the memory module, the permanent memory, the comparison circuit and the control module are used. The comparison circuit, which compares the results of the two successive iterations outputs information to the control module which sends a signal to continue or stop the iteration process in the given time step and to go onto the next step. The boundary conditions are corrected by using the digital computer by the information about the potentials of the boundary points obtained from the passive model.

The permanent memory is a multifunctional specialized memory which performs the following operations: conversion of the values of the functional to the digital analogs of the potentials, calculation of the correction parameters by the known digital values of the potentials, conversion of the potentials to the value of the desired function of the initial mathematical model.

This memory bears the nature of the table, to the address register of which the corresponding digital codes come (depending on the operating conditions of the hybrid computer). On input of the initial data, the digital codes of the initial conditions come to the address register of the permanent memory, and the information required for entry in the

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specific register of the code-controlled voltage source is read from the output register of the memory.

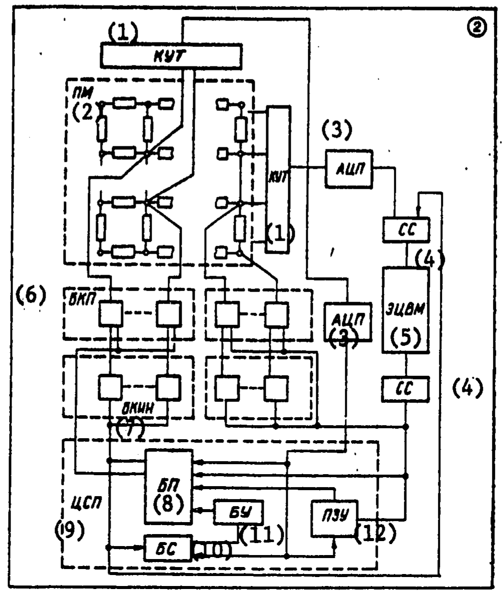

Figure 2. Functional diagram of the triple-processor hybrid computer system

Key:

1. Node point commutator
2. Passive model
3. Analog-to-digital converter
4. Coupler
5. Digital computer
6. Code-controlled conductivity module
7. Code-controlled voltage source module
8. Memory module
9. Specialized digital processor
10. Comparison circuit
11. Control module
12. Permanent memory

When printing out the data and calculating the values of the corrected parameters, the digital code of the node point potential of the analog processor is fed to the address register of the permanent memory. The information transmitted to the code-controlled conductivity register or the value of the desired function required for output of the solution results can be read from the output register of the permanent memory.

The problem of the organization of a specialized memory can also be solved by using the ready-access memory of the digital computer. However, the ready-access memory of the digital computer for the analog process is an external memory, and, as is known, reference to any external devices leads to nonproductive expenditures of time on the exchange of ready

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signals between the devices. The capacity of the memory required to solve the problem can be calculated by multiplying the word length times the number of stored words. The word length is equal to the sum of the binary bit of the code-controlled conductivity and the bits required for expression of the function T and Θ. The number of stored words is determined by the formula $n = U_{max}/U_{min}$ where U_{max} is the maximum value of the measured potentials in the grid nodes, U_{min} is the weight of the low-order bit of the analog-to-digital converter.

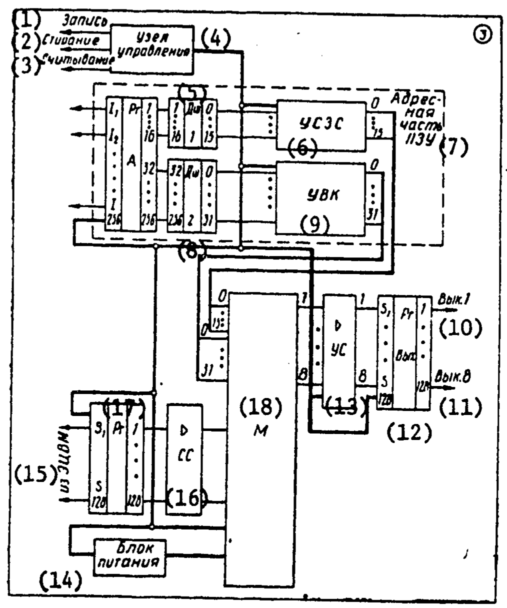

Figure 3. Functional diagram of the permanent memory

Key:

1. Write
2. Erase
3. Read
4. Control unit
5. Matrix input access decoder DSh1
6. Clear-enter-read junction
7. Address part of the permanent memory
8. Crystal access decoder DSh2
9. Read crystal access and write forbid junction UVK
10. Switch 1
11. Switch 8
12. Output register
13. Read amplifier
14. Power supply
15. From the digital computer
16. Voltage level matching circuit
17. Register
18. Memory

The selection of the technical specifications of the memory is made by setting up a mathematical experiment on the digital computer considering the class of solved problems. Thus, if the permanent memory must service the solution of the nonlinear problems of thermal conductivity, it is necessary to solve a number of problems for objects with different

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thermophysical characteristics (these solutions are realized on the digital computer using digital simulation of the operation of the hybrid computer). Mathematical experiment gave the following characteristics: the number of words greater than or equal to 512, and the number of binary bits in a word greater than or equal to 8.

The specialized memory can be realized on the K519RYe1 integrated semiconductor microcircuits which are memories with electrical replacement of information retaining information when disconnecting the feed voltages for 2000 hours.

Fig 3 shows the functional diagram of the permanent memory which includes the address register RgA, the decoder for access to the matrix input DSh1, the crystal access decoder DSh2, the clear-enter-read junction USZS, the read crystal access and write forbid junction UVK, the information input register Rg_{inp}, the read amplifiers US, the information output register RG_{out}, the memory M consisting of 32 K519RYe1 matrices, the control unit, the power supply, the voltage level matching circuit SSU. All of the registers and decoders of the permanent memory are executed from microcircuits in the 155 series.

The use of the multifunctional memory made it possible to remove the digital computer from such operations as the conversion of the desired function to the simulated function Θ and vice versa, on which a great deal of machine time was expended. Now these operations are performed in parallel with the operation of calculating the corrections for the next iteration. In addition, in contrast to the digital computer memory, all of the writing and reading of information takes place in series; in the memory module the reading is done in parallel inasmuch as structurally the memory cells are separated with respect to the grid nodes. For example, on the code-controlled conductivity plate there are two registers: the memory cell of the memory module and the code equivalent of the conductivity. This essentially increases the speed of the system.

In conclusion, let us note that the use of the specialized memory permits the construction of a hybrid computer system without an all-purpose digital computer (this is especially significant when solving a narrow class of problems). As the class of solved problems expands, additional specialized digital processes are connected. The role of the digital computer is constructed, being limited to the problems of the coordination of the operation of the remaining processors. These functions turn out to be significant when solving the set of problems interrelated with each other.

BIBLIOGRAPHY

1. Nikolayev, N. S.; Kozlov, E. S.; Maksimov, M. N. "Purpose and Principles of the Construction of the "Saturn" Analog-to-Digital Computer Complex," SREDSTVA ANALOGOVOY I ANALOGO-TSIFROVOY VYCHISLITEL'NOY

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

TEKHNIKI [Means of Analog and Analog-to-Digital Computer Engineering], Moscow, Mashinostroyeniye, 1968.

2. Rode, E. E.; Spalvin', A. P. "'Good-Digital Computer' Hybrid Computer Systems," AVTOMATIKA I TELEMEKHANIKA [Automation and Telemechanics], No 9, 1972, pp 95-102.

3. Matsevityy, Yu. M.; Malyarenko, V. A.; Tsakanyan, O. S.; Lushpenko, S.F. "Analog-to-Digital Computer Complex for Solving Nonlinear Problems of Field Theory," ELEKTRONIKA I MODELIROVANIYE [Electronics and Simulation], No 15, 1977.

4. Matsevityy, Yu. M. ELEKTRICHESKOYE MODELIROVANIYE NELINEYNYKH ZADACH TEKHNICHESKOY TEPLOFIZIKI [Electrical Simulation of Nonlinear Problems of Technical Thermophysics], Kiev, Nauk. dumka, 1977, 256 pp.

5. Matsevityy, Yu. M.; Malyarenko, V. A.; Tsakanyan, O. S.; Paley, V. A.; Povolotskiy, L. V.; Sukharev, F. M. "Procedure for Investigating the Thermal State of the Elements of Turbo Machines on an Analog-to-Digital Computer Complex," PROBLEMY MASHINOSTROYENIYA [Problems of Machine Building], No 6, 1978.

6. Matsevityy, Yu. M.; Malyarenko, V. A.; Tsakanyan, O. S. "Comparison of the Structures of the Analog Processors for a Medium-Class Hybrid Computer," ELEKTRONNOYE MODELIROVANIYE [Electronic Simulation], Kiev, Nauk. dumka, 1977, pp 109-120.

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APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

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CONSTRUCTION OF MULTICHANNEL ANALOG COMMUTATORS BASED ON STANDARD MICROCIRCUITS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 81-85

[Article by P. P. Azbelev, A. A. Vorontsov, I. I. Rybkin]

[Excerpts] In the systems for multichannel data transmission and processing wide use is made of the analog signal commutators based on the MOS-transistors providing for the connection of the output alternately to one of several inputs. Soviet industry has, in particular, developed integrated microcircuits of analog commutators based on the p-channel MOS-transistors: K590KN-1 8-channel with built-in decoder and K591KN-1 16-channel with built-in decoder, counter and control unit (with respect to logical inputs both of the microcircuits are compatible with the TTL-circuits). However, it is necessary to construct commutators with a significantly larger number of channels. The execution of such commutators in this form of microcircuits is impossible, first of all as a result of the extraordinary increase in the crystal area occupied by the switches and secondly, as a result of the restrictions on the number of leads of the case. Therefore, the commutators with a large number of channels must be built using several microcircuits.

A study is made below of the methods of joint inclusion of several K591KN-1 microcircuits in the structure of the multichannel commutator.

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SECOND ALL-UNION CONFERENCE ON THE PROSPECTS AND PROBLEMS OF DEVELOPMENT OF COMPUTER ENGINEERING

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 85

[Article by A. V. Kalyayev, V. D. Samoylov]

[Text] On 5-6 December 1979, the Second All-Union Conference on Prospects and Problems of Development of Computer Engineering organized by the State Committee of the Council of Ministers of the USSR on Science and Engineering, the USSR Academy of Sciences, the Scientific Council on Computer Engineering and Control Systems of the State Committee on Science and Engineering of the Council of Ministers of the USSR and the Presidium of the USSR Academy of Sciences, the Computer Center of the Siberian Department of the USSR Academy of Sciences was held in Novosibirsk (Akademgorodok). The work of the conference was participated in by Soviet scientists, representatives of the USSR Council Gosplan, the State Committee of the USSR Council of Ministers on Science and Engineering, the USSR Ministry of the Radio Industry, the USSR Ministry of the Electronic Industry, the USSR Ministry of Communications, the USSR Ministry of Instrument Making, the USSR Ministry of Means of Automation and Control Systems and other ministries and departments.

In the opening address Academician G. I. Marchuk (Novosibirsk) noted that Soviet computer engineering has made significant progress both on the scientific and on the applied level during the period that has passed since the time of the first all-union conference. Accordingly, the necessity has arisen for the discussion of a number of important problems to determine the prospects for further development of computer engineering. Doctor of Technical Sciences V. A. Myasnikov (Moscow) gave a substantive report on this problem. He noted the basic areas of research, development and introduction insuring significant advancement in the matter of improving the hardware and software of computers and also he discussed individual deficiencies in the development of these means.

The report "Electronic Instruments for Modern Computer Means" was given by Chief of the Main Administration of the Ministry of Electronic Industry V. M. Proleyko (Moscow). He characterized the state of development of

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the electronic base for computer engineering means and also the plans of the ministry with respect to further improvement of the published nomenclature and organization of series output of new elements.

Academician V. M. Glushkov (Kiev) devoted his report "Paths of Development of the Architecture of Multiprocessor Computers" to a discussion of means of improving the speed and effectiveness of electronic computers. On the basis of analyzing the development of computer engineering means, conclusions are drawn regarding the prospectiveness of investigating all-purpose multiprocessor computer systems and the creation of problem-oriented processors for connection to such systems.

A discussion of the paths of development and prospects for improvement of the means of computer engineering was held under the chairmanship of Academician A. A. Dorodnitsyn (Moscow). The discussion was participated in by the well-known Soviet scientists-- specialists in hardware and software for computers: Corresponding Member of the USSR Academy of Sciences G. S. Pospelov, Doctor of Technical Sciences A. V. Kalyayev, Doctor of Technical Sciences V. V. Lipayev, Doctor of Technical Sciences M. B. Ignat'yev, and other scientists.

At the conference substantive reports were also given by the chief designers of three basic areas of development of all-purpose computers.

In the report "Basic Problems of the Development and Creation of Highly Efficient Computers and the Electronic Design Base for Them" Corresponding Member of the USSR Academy of Sciences V. S. Burtsev (Moscow) characterized the state of the developments with respect to the creation of large multiprocessors, high-output computers.

In the report "State of the Art and Prospects for Further Development of Integrated Computer Systems" Doctor of Technical Sciences V. V. Przhiyalkovskiy (Moscow) made a survey of the state of the art in the development and the production of computers in the united series, the peculiarities of the structure, the software and the element base of the new series of the integrated system of computers planned for development.

In the report by Corresponding Member of the USSR Academy of Sciences B. N. Naumov (Moscow) a study was made of the prospects of the development of the system of small computers and, in particular, the control computer within the framework of the SM EVM computer series and also the software for them.

The conference aroused a great deal of interest among the specialists in computer engineering. Its work was participated in by about 500 specialists in this field.

The good organization of the work of the conference was noted, in which a great deal of credit goes to the hosts -- the coworkers of the Computer Center of the Siberian Department of the USSR Academy of Sciences.

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CALCULATION OF THE LOWER BOUNDS OF THE RELIABILITY INDEXES OF CERTAIN SYSTEMS USING SERIES CONSOLIDATION OF STATES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 86-88

[Article by V. A. Arentov]

[Excerpts] Recently more and more attention has been given to the development of methods of estimating the reliability indexes of complex systems with a large number of states using the idea of enlargement of the states of random processes describing the operation of these systems. In this area the most significant results were obtained in references [1, 2].

In the given article the algorithm designed for execution on a computer is presented for calculating the lower bounds of the reliability indexes of systems with different types of redundancy, the functioning of which to failure can be interpreted as the time of a semimarkov process in a given set of states. It is possible to consider computer complexes which perform responsible functions for a given time, data transmission systems and so on among such systems.

BIBLIOGRAPHY

1. Korolyuk, V. S.; Turbin, A. F. POLUMARKOVSKIYE PROTSESSY I IKH PRILOZHENIYA [Semimarkov Processes and Their Application], Kiev, Nauk. dumka, 1976, 242 pp.

2. Kovalenko, I. N. ISSLEDOVANIYA PO ANALIZU NADEZHNOSTI SLOZHNYKH SISTEM [Research in the Analysis of the Reliability of Complex Systems], Kiev, Nauk. dumka, 1975, 210 pp.

3. Arentov, V. A. "Estimate of the Reliability of Complex Systems Using a Method of Consolidating States," MATEMATICHESKIYE METODY ISSLEDOVANIYA OPERATSIY I TEORII NADEZHNOSTI [Mathematical Methods of Investigating Operations and Reliability Theory], Kiev, Cybernetics Institute of the Ukrainian SSR Academy of Sciences, 1978, pp 54-62.

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[201-10845]

10845
CSO: 1863

APPROVED FOR RELEASE: 2007/02/08: CIA-RDP82-00850R000200090032-5

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PROCEDURE FOR SIMULATION OF COMPLEX DIGITAL DEVICES WITH FAULTS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 89-91

[Article by I. A. Zakhar'yevich]

[Excerpts] The simulation of systems with faults is used when estimating the test series with respect to detecting capacity, localization of the faults and also when estimating the fitness of the system with faults.

One of the best known methods of processing faults is simulation which for each fault α simulates the model of the system A^{α}, that is, one fault is simulated each time. However, inasmuch as at the present time the systems are large, and the simulation process is slow, the necessity arises for using highly effective simulation techniques. One such technique is the deductive algorithm which in one pass of the program simulates all the faults. The propagation of the faults through the system is simulated using special lists of faults. In large systems these lists can be enormous, and for the storage and processing of them significant expenditures of digital computer memory are required. Therefore, if this is possible, the system is represented in the form of functional modules. The simulated logic inside such a module can be omitted (in order to save computer simulation and memory time). The problem consists in providing for advancement of the list to the functional modules and from them.

Thus, if we simulate the system modules, adding control lines to them, then all of them can be connected and disconnected selectively. This offers the possibility of compiling dictionaries of failures not for the entire system immediately, but by parts and the storing and processing of lists of failures in the ready-access memory of the digital computer.

BIBLIOGRAPHY

1. Armstrong, D. B. "A Deductive Method for Simulating Faults in Logic Circuits," IEEE TRANSACTIONS ON COMPUTERS, May 1972, Vol C-21, pp 464-471.

2. Kagan, B. M. ELEKTRONNYYE VYCHISLETEL'NYYE MASHINY I SISTEMY [Electronic Computers and Systems], Moscow, Energiya, 1979, 528 pp.

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BASIC PROCEDURAL PRINCIPLES OF BUILDING A SPECIALIZED HYBRID COMPUTER TO SOLVE THE PROBLEMS OF OPERATIVE CONTROL OF THE OPERATING CONDITIONS OF GAS TRANSPORT SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 92-97

[Article by S. G. Akopyan]

[Excerpt] The operative control of the territorial gas transport systems (TGTS) is connected with determining the set of states of the system requiring processing of a large quantity of information in a short time interval. It is not easy to use all-purpose digital computers to perform calculations for the complex TGTS systems with dozens of sections and junctions, for the programming process is tedious and requires a large computer memory size and significant expenditures of machine time. For example, in accordance with the "gradient" program [1] for the calculation of one optimal version of the operating conditions of the Transcaucasus TGTS made up of 33 node points, 33 sections (a total of 74 variables) it takes more than 5 hours of machine time on the YeS-1030. The application of more improved methods, for example, the method of sliding tolerance [2] reduces the solution time to two hours.

When solving the problems connected with the operation of maintenance of the TGTS, the necessity arises for analysis of a large number of possible versions of various emergency conditions obtained on variation of the position of the individual slide valves of the main gas lines, the planned gas feeds, disconnection of the users,and so on, which requires multiple solution of the same problem with different input data.

Modern computers do not have the possibility of processing such a number of versions of states and information in acceptable times. Therefore at the present time and in the near future digital computers cannot completely replace the remaining known computer media.

The application of analog computers and devices for the calculations will permit us comparatively quickly to obtain the solution results. However, as a result of the presence of an error in them the analog computers have a limited range of application (especially when realizing nonlinear functions).

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At the present time, along with separate use of analog and digital computers, the theory and practice of the creation of hybrid computers have taken an independent direction [3]. Hybrid computers permit the fullest use of the positive qualities of analog and digital computer engineering and they make possible a significant increase in output capacity and efficiency. The solution of the investigated problem of the operative control of the TGTS is most expediently found on a specialized hybrid computer. This article is devoted to the basic procedural principles of the construction of a specialized hybrid computer designed for operative control of complex connected TGTS by determining the optimal regime parameters. The hybrid computer must be the "adviser" of the dispatcher, that is, only make recommendations, and the final solution is made by the dispatcher.

The effectiveness of introducing hybrid computers, for example, in the Armenian TGTS, can be determined by the system investigated in reference [4] containing 22 node points, 27 sections, 15 constant and 4 variable large users, one compressor station and one underground gas storage (a total of 49 variables). The results of the solved example are compared with the results of the existing distribution of the gas flows (the existing distribution data were taken from the dispatch service of the Armtransgaz [Armenian Gas Transport Administration]).

The comparisons demonstrated that as a result of the optimal distribution of the gas flow between the large users and in the sections a cost benefit in the amount of 7,200 rubles/day is expected (there are more than 2 million rubles in the annual section). In the investigated example basically the savings are obtained as a result of primary feed of the gas to the most efficient users with respect to the gas utilization processes.

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STUDY OF A DISCRETE SEMIMARKOV SYSTEM WITH INDEPENDENT INCREMENTS OF PROFITS AND LOSSES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 100-101

[Article by A. M. Zakharin]

[Excerpt] The results presented below can be used to estimate the effectiveness of various technical and economic systems described by semimarkov processes, the evolution of which is paid for, in accordance with certain uniform processes, with independent increments.

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ANALOG SIMULATION OF THE RANDOM PROCESS OF 'WANDERING ABOUT SPHERES'

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 101-104

[Article by K. A. Babordin]

[Excerpt] In order to find the solution of the boundary problem of mathematical physics at some point of the region by the Monte Carlo method, it is necessary to construct a significant number of random trajectories (several thousand). This peculiarity of the method prevented its practical application before the appearance of sufficiently fast digital computers which make it possible to obtain the solution in an acceptable time for practice, remaining, however, quite large.

In reference [1] it was demonstrated that the high-speed analog computer combined with a digital computer and interface makes faster probability solution of the problems of mathematical physics possible by comparison with the probability solution obtained in purely digital form. In the prepared mockup [1] the random trajectories were found by simulation of a continuous Markov process on an analog device.

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FOURTH ALL-UNION CONFERENCE ON TECHNICAL DIAGNOSTICS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 pp 105-106

[Article by V. A. Gulyayev]

[Text] The Fourth All-Union Conference on Technical Diagnostics was held in Cherkassy on 4-6 September 1979. The conference was organized by the Control Problems Institute of the USSR Academy of Sciences (Moscow) and the Electronics and Simulation Section of the Electrodynamic Institute of the Ukrainian SSR Academy of Sciences (Kiev) within the framework of the National Committee of the USSR on Automated Control and the Scientific Council of the Ukrainian SSR Academy of Sciences on the Complex Problem of Theoretical Electronic Engineering, Electronics and Simulation.

The conference was participated in by about 300 specialists from Moscow, Leningrad, Kiev, Novosibirsk, Vladivostok and other cities. There were 13 sections of the conference:

1. Diagnostic support systems.

2. Methods and means of functional diagnosis.

3. Methods of constructing tests.

4. Test diagnostic means.

5. Monitoring, suitability and effectiveness of the diagnostic system.

6. Models of diagnostic targets.

7. Methods of diagnosing continuous objects.

8. Means of diagnosing continuous objects.

9. Experiments on automatic machines.

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10. Diagnosis of software.

11. Diagnosis of natural scientific subjects.

12. Vibroacoustic methods of diagnosis.

13. Methods of predicting the technical state of objects.

The conference was opened by Academician of the Ukrainian SSR Academy of Sciences G. Ye. Pukhov. Then in the opening remarks Prof P. P. Parkhomenko discussed the problems facing technical diagnostics.

The plenary session heard reports by A. Mozgalevskiy, G. G. Kostandi, "Problems of Diagnostic Support of the Planning and Design of Engineering Objects." G. G. Kostandi also gave a report on the problems and plans in the field of technical diagnostics. Reports were given by I. A. Birger, Ye. I. Boldyrev, N. G. Dubrovskiy, V. A. Karasev, "Diagnosis and Control of the Condition of Aircraft Engines"; Ye. G. Nakhapetyan "Application of Quasimetric Methods for Diagnosing Machinery"; O. D. Klimpush, B. V. Levinson, V. S. Gerner, V. A. Zaretskiy "Improvement of the Efficiency and Quality of Diagnosing Motor Vehicles with the Help of Automation"; V. B. Kosharskiy "Diagnosis of Production Situations in the Organizational Control Systems"; D. I. Kalachanov "Systems Approach to the Insurance of the Given Operating Indexes of Complex Systems in the Process of Their Development."

In the first section 24 reports of a theoretical and practical nature were heard. Special interest was aroused in particular by the reports of G. V. Blazhiyevskaya "System for Operative Test Monitoring of the Integrated System of Computers"; V. G. Gotsenko, et al., "System for Technical Diagnosis of Standard Replacement Elements"; V. R. Gorovyy, M. I. Kushnir, "Message Commutation Center -- Restoration of Fitness"; S. G. Sharshunov "Ternary Simulation of Digital Devices with Macromodules"; V. A. Vedeshenkov, A. M. Nesterov "Analytical Approach to Decoding the Results of Checking the Digital Diagnosed Systems"; V. P. Chipulis "Analytical Method of Diagnosing Digital Devices"; A. Ye. Dudkin, Yu. G. Savchenko "Algorithm for Processing the Results of a Diagnostic Experiment When Using a Standard."

From the reports and messages made from the second section it is necessary to note the following: "Support of the Functional Reliability of Multiprocessor Computer Complexes" by Yu. N. Nikol'skiy; "Reduction of Equipment Expenditures with Self-Checking Redundancy" by G. P. Aksenova, V. A. Vashin; "Organization of the Monitoring System in Small Control Computers" by T. I. Zrelova.

Interest was aroused by the reports in the third section: "Synthesis of Pseudorandom Test Series for Monitoring Logical Units" by A. M. Romankevich, Yu. S. Vilinskiy, V. N. Valuyskiy, N. D. Stukach; "Construction of Complete

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Diagnostic Tests for Standard Replacement Elements with an Average Degree of Integration" by V. G. Petrov; "Rules for Recurrent Gluing of the Checking Test of a Series Automatic Machine" by A. N. Sklerevich; "Construction of the Tests for PLM" by A. D. Zakrevskiy; "Generation of Tests for Digital Devices on the Alternative Graphs Model" by R. R. Ubar; "An Approach to the Structure of the Diagnosis of Failures of the Operations Circuits of Digital Computers" by A. V. Tyurin.

Among the reports given in the fourth section it is possible to note the following: "Preliminary Step in the Design of Technical Diagnostic Means" by A. V. Mozgalevskiy, V. P. Kalyavin and A. M. Malyshev; "Dual System of Equipment Monitoring" by L. A. Mironovskiy; "System for Diagnosing Supertrawler Automation Means" by M. V. Zhukov, L. P. Sitnikov.

Out of the reports which were given in the remaining sections the following are specially noted: "Consideration of the Effect of the Dynamics of the Service Process on the Diagnostic Effectiveness" by L. A. Korinevskiy; "Effect of Control Errors on the Operating Conditions of a Technical System" by V. A. Ignatov, V. V. Ulanskiy; "Optimization of the Technical Servicing of Complex Systems with Respect to Condition" by G. A. Nikitin, V. A. Ubogov; "Statistical Method of Determining the Completeness of Tests" by D. M. Grobman; "Use of Macrodescriptions of Standard Digital Devices for Improving the Effectiveness of the Structure of the Tests" by A. D. Plitman; "Application of Multistep Methods in the Problems of Indirect Control" by V. S. Godlevskiy, A. N. Zavarin; "Theory and Methods of Diagnosing Linear Electrical Circuits" by N. V. Kinsht, et al.

Let us note that for the first time at the fourth conference new prospective sections appeared: "Software Diagnostics" (V. V. Danilov gave an interesting report on the diagnosis of programs and multiprocessor devices) and "Diagnosis of Natural Scientific Subjects" (a great deal of interest was aroused by the report by R. S. Gol'dman "Models of Odd Logic in Diagnosis Problems").

Two discussions were held at the conference on the control suitability of targets and the means of test diagnosis (P. P. Parkhomenko, G. B. Serdyuk, V. A. Khalchev).

The work of the conference proceeded on a high scientific level. The participants adopted a resolution in which they planned the paths of further development of means and methods of technical diagnostics and they generated recommendations with respect to overcoming the existing difficulties. It is proposed that part of the report be published in the journal ELEKTRONNOYE MODELIROVANIYE [Electronic Simulation].

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MEETING OF THE NATIONAL COMMITTEE OF THE USSR INTERNATIONAL ASSOCIATION ON ANALOG COMPUTATIONS (IMACS-AICA)

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 106

[Article by Ya. N. Luginskiy, Yu. P. Kamayev]

[Text] A meeting of the National Committee of the USSR of the International Association on Analog Computations (IMACS-AICA) was held on 7-8 September in Kuybyshev.

The meeting was participated in by representatives of Kuybyshev, Moscow, Kiev, Leningrad, Khar'kov, and other scientific centers of the country. The results of the investigations coordinated by the Kuybyshev territorial group of the National Committee for the Development and Application of Methods and Technical Means of Simulation for the Solution of National Economic Problems in the Field of Automation of Scientific Research, Planning and Design and Control Processes were discussed at the meeting.

Opening the meeting, the chairman of the National Committee, Academician of the Ukrainian SSR Academy of Sciences G. Ye. Pukhov discussed the problems of the National Committee and its activities, he informed the audience of the discovery and scientific direction of the new academic journal ELEKTRONNOYE MODELIROVANIYE [Electronic Simulation].

The participants in the meeting were greeted by the vice chancellor with respect to scientific work of the Kuybyshev Polytechnical Institute, Doctor of Technical Sciences, Prof Yu. P. Samarin. In his report, he noted the important role of the scientific contacts with specialists for the coordination and planning of research and indicated the special significance in this light of the holding of the meeting at the Kubyshev Polytechnical Institute base, for the scientific collective of which the development of the problems of mathematical and machine simulation is a traditional area.

At the meeting of the National Council the following reports were presented: "Nonparametric Methods of Processing Experimental Data" by Yu. P. Samarin, "Problem-Oriented Mathematical Simulation of the Processes in Automated

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Control Systems" by N. V. Diligenskiy, "Exact Methods in the Applied Problems of the Optimal Control of Mathematical Models of the Processes of Nonstationary Thermal Conductivity" by E. Ya. Rapoport, "The Problems of the Approximation of Distributed Objects by Finite Dimensional Models" by Yu. P. Kamayev, "Automated Simulating Systems Based on Analog and Analog-Digital Operation Modules" by Yu. N. Kolomiytsev, "Problems of the Automation of the Investigation and Simulation of Acoustic Processes Based on the Integrated System of Computers" by S. V. Arkhangel'skiy.

The problems of the software for machine simulation of objects with distributed parameters as questions of an independent scientific problem in procedural respects were discussed in the reports. The concept of the application of precision methods for the solution of the problems in this class advanced in the reports received support.

In the concluding remarks Academician of the Ukrainian SSR Academy of Sciences G. Ye. Pukhov noted the high scientific level of the experiments considered at the meeting, he noted the urgency of the research performed in the Kuybyshev region, the direction of these studies toward the solution of the theoretical problems of mathematical simulation. He highly estimated the new scientific results in the development of the methodology of the software and hardware for machine simulation.

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NONPOSITIONAL REPRESENTATIONS IN MULTIDIMENSIONAL NUMBER SYSTEMS[1] -- BOOK REVIEW

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 107

[Article by Corresponding Member of the Kazakh SSR Academy of Sciences I. Ya. Akushskiy]

[Text] At the present time with complication of the modern problems of science and engineering the necessity is arising for the indication of more complex number constructions in addition to the apparatus of natural and complex numbers. The most widespread of them are the quaternions, biquaternions and octaves. The use of these number systems leads to new procedural approaches and frequently to simplification of the systems of equations describing certain phenomena and processes.

The effectiveness of the application of such methods and especially in the statement of them for computer calculations will increase significantly if we exclude defining the difficulties connected with the processing of imaginary variables.

Significant advantages when working with complex numbers are observed when using the fundamental theorem of Gauss on the isomorphism in the classes of real and complex residues when considering the conditions on the selection of the moduli of the non-positional calculus.

The authors have developed methods of non-positional representation in a broad class of multidimensional hypercomplex number systems. Thus, in the second chapter a study is made of the non-positional representations for second-order number systems -- dual and double numbers. The third and fourth chapters of the book contain studies of commutative and non-commutative doublings of second-order number systems. The important fundamental theorems of isomorphism analogous with respect to structure

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[1] M. V. Sin'kov, N. M. Gubareni, NEPOZITSIONNYYE PREDSTAVLENIYA V MNOGOMERNYKH CHISLOVYKH SISTEMAKH [Non-Positional Representations in Multidimensional Number Systems], Kiev, 1979, 7.35 printer sheets, 138 pages, 21 references.

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to the fundamental Gaussian theorem are proved here. The book was written on a high scientific level and is subordinate to the single idea of studying the peculiarities of multidimensional number systems in the case of the non-positional method of representation.

The studies performed are oriented toward obtaining important theoretical and practical results in applied mathematics and computer engineering.

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HYBRID COMPUTER COMPLEXES ORIENTED TOWARD STUDYING THERMAL AND STRESS-STRAIN STATES OF STRUCTURAL ELEMENTS -- ANNOTATION OF DOCTOR'S DISSERTATION

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 107

[Article by Igor' Dmitriyevich Konoplev, OIIMF Institute]

[Text] Specialty 05.13.13.

The following are proposed in the dissertation:

A method of synthesizing a quasianalog computer oriented toward complex mathematical simulation of the thermal and stress-strain states of structural elements, the convergence of the iterative quasianalog algorithms occurring here is proved.

The method of synthesizing the simulating medium of grid analog computers permitting insurance of uniformity of the controlled elements, simplification of the structural design of the analog computer and the problem of its automation;

The procedure for precision synthesis of the grid analog computer permitting determination of the required number of bits for representation of the initial data and the results in the analog computer and also the number of nodes of the simulating grid;

The procedure for a posteriori study of the error of the net-point method and the empirical relations for predicting the maximum possible error of the net-point method.

A large-scale scientific and technical problem is solved in the paper -- the synthesis theory, the principle of the construction and use of quasianalog computers for mathematical simulation of the thermal and stress-strain states of structural elements are developed. On the basis of the developed theory a hybrid computer complex was created consisting of the grid analog computer and all-purpose digital computer.

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The introduction of the results of this paper took place at the Leningrad Ekonomayzer Plant, the Khar'kov Electromechanical Plant and a number of other organizations with an annual cost benefit of about 1 million rubles.

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Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 108

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SYNTHESIS OF NONLINEAR SYSTEMS. NONRECURSIVE SYSTEMS, DETERMINISTIC CASE

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 110

[Article by A. A. Lanne, ELEKTRON. MODELIROVANIYE, 1980, No 1, pp 60-68]

[Text] The synthesis problem is formulated as the problem of the construction and execution of an operator which realizes the mapping of one class of signals into another. The basic theorems connected with the existence and the structure of a physically realizable operator are formulated. Numerical examples are considered. Possible generalizations are discussed. There are two tables, 13 illustrations, and 6 references.

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DIAKOPTICS OF THE EQUATIONS OF STATE OF ELECTRIC CIRCUITS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 111

[Article by M. A. Shakirov, ELEKTRON. MODELIROVANIYE, 1980, No 1, pp 68-76]

[Text] The generalized principle of diakoptics -- the equivalent multidimensional hybrid source method -- is formulated. This principle is applicable for the solution of both types of problems of diakoptics: calculation by parts of the steady-state modes of linear circuits and the formation by parts of the circuit equations, including the equations of state. There are 5 illustrations and 16 references.

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UDC 621.3.013.24

A METHOD OF ANALYZING A STATIONARY MAGNETIC FIELD IN A NONLINEAR MEDIUM

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 1, 1980 p 112

[Article by T. G. Myalkovskaya, A. Ye. Stepanov, ELEKTRON. MODELIROVANIYE, 1980, No 1, pp 98-99]

[Text] A procedure is presented for computer calculation of a stationary magnetic field in an isotropic nonlinear medium based on replacement of the boundary problem by the Cauchy problem. There are one illustration and 4 references.

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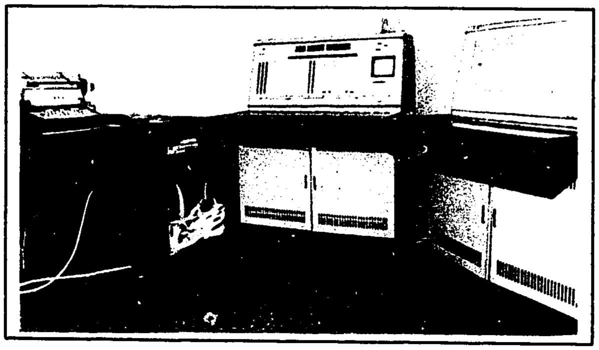
[Text]



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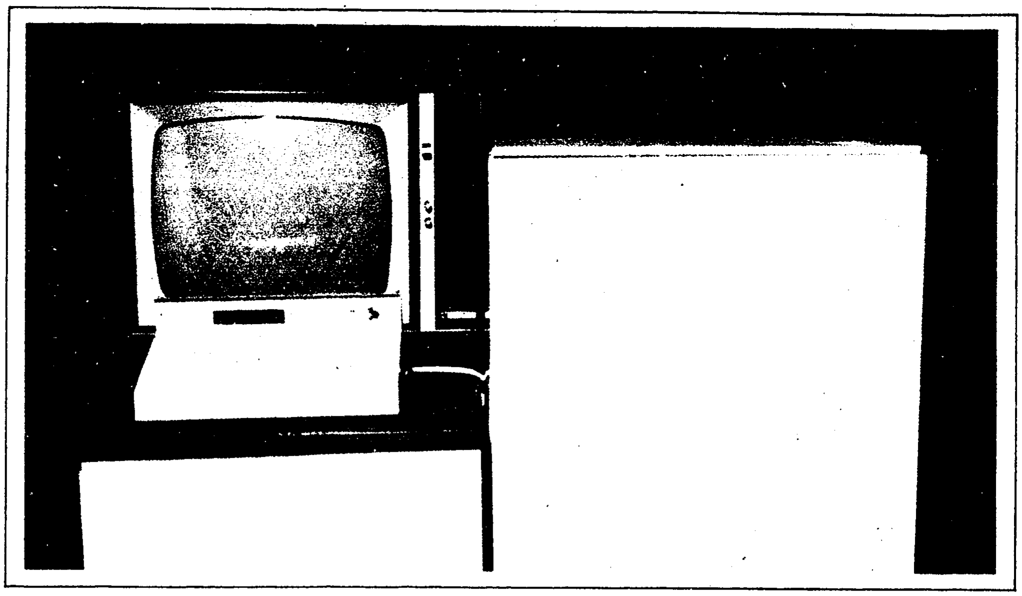

An outside view of a specialized hybrid simulator for investigating extremal paths on uniform networks is shown. The structure permits approximate solution of uniform variation problems by reducing them to the equivalent shortest-path problem. [Inside Back Cover]

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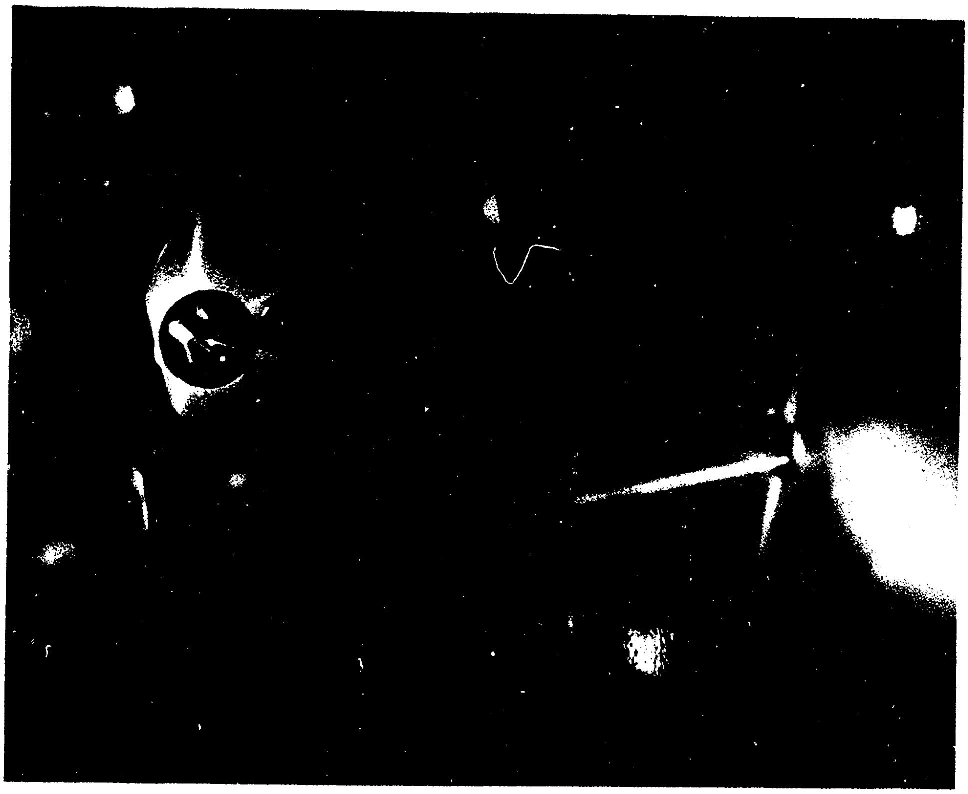

[Inside Back Cover]

Equipment for optically recording and processing information

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